

*Федеральное государственное автономное образовательное учреждение  
высшего образования «Российский университет дружбы народов»*

*Faculty of Ecology*

Recommended by the Methodological council  
on specialties and study directions

## WORKING PROGRAM OF THE DISCIPLINE

Name of the discipline

**ENVIRONMENTAL STATISTICS**

Recommended for the specialty/ direction

**05.04.06 Ecology and nature management**

Masters' program:

***Economics of natural resources management***

### 1. Aim and scope:

The objectives of the discipline are the formation of professional competencies (PC, PC4) in accordance with the state educational standard in the direction of 05.04.06, including:

- Ability to apply modern computer technologies in collecting, storing, processing, analyzing and transmitting information and for solving research and production-technological problems of professional activity
- The ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, the development and implementation of socially significant projects and to use in practice skills and abilities in the organization of research and scientific-production work, in the management of the scientific team
- Possession of the basics of design, expert and analytical activities and research performance using modern approaches and methods, equipment and computing systems
- Ability to use modern methods of processing and interpreting environmental information in scientific and industrial research

### 2. Place of discipline in the structure of the educational program:

The discipline Environmental statistics refers to the disciplines of the choice of block 1 of the curriculum.

Table 1 shows the previous and subsequent disciplines aimed at the formation of discipline competencies in accordance with the competence matrix of ES HE,

Table 1

#### Previous and subsequent disciplines aimed at building competencies

Nr.	Code and name of competence	Preceding disciplines	Subsequent disciplines (groups of disciplines)
1	General professional competence -2 Ability to apply modern computer technologies in collecting, storing, processing, analyzing and transmitting information and for solving research and production-technological problems of professional activity	-	
2	General professional competence -6 The ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, the development and implementation of socially significant projects and to use in practice skills and abilities in the organization of research and scientific-production work, in the management of the scientific team	-	
<i>Профессиональные компетенции (вид профессиональной деятельности – научно-исследовательская, контрольно-экспертная, организационно-управленческая)</i>			
3	Professional competence -3 Possession of the basics of design, expert and analytical activities and research performance using modern approaches and methods, equipment and computing systems	-	Environmental projects
4	Professional competence -4 Ability to use modern methods of processing and interpreting environmental information in scientific and industrial research	-	Environmental projects

### 3. Requirements for the results of mastering the discipline:

The process of studying the discipline is aimed at the formation of the following competencies (in accordance with research, control and expert, organizational and management areas of activity):

General professional competence -2 Ability to apply modern computer technologies in collecting, storing, processing, analyzing and transmitting information and for solving research and production-technological problems of professional activity

General professional competence -6 The ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, the development and implementation of socially significant projects and to use in practice skills and abilities in the organization of research and scientific-production work, in the management of the scientific team

Professional competence -3 Possession of the basics of design, expert and analytical activities and research performance using modern approaches and methods, equipment and computing systems

Professional competence -4 Ability to use modern methods of processing and interpreting environmental information in scientific and industrial research

### 4. The scope of the discipline and types of educational work

The total labor intensity of the discipline	3 credits								
Type of educational work	Total hours	Semesters							
		1	2	3	4	5	6	7	8
<b>Classroom Lessons (total)</b>									
<b>Including:</b>									
<i>Lectures</i>	9	9							
<i>Practical lessons</i>	18	18							
<i>Seminars</i>	-								
<i>Laboratory work</i>	-								
<i>Independent work</i>	79								
Control	2								
The total labor intensity, hours.	108								
The total labor intensity, credits	3								

### 5. Discipline content

#### 5.1 Contents of discipline sections

Discipline section name	Section content (topics)
1. Introduction	The environment as an object of statistical observation. Sources of statistical data in the field of environmental protection, ecological safety and environmental management
2. State statistical observation	State statistical observation. Accounting and reporting systems. Theoretical foundations of environmental statistics. Characterization of natural resources as part of the national wealth. System of indicators for statistics of natural resources. Environment and natural resources statistics
3. Environmental statistics of enterprises and companies	Statistical observation in the field of environmental management and sustainable development at the level of enterprises and companies. Reporting formats. Using observation results
4. Methods of statistical processing and data analysis	Methods of statistical processing and data analysis. Correlation and regression analysis. Basic concepts of correlation and regression analysis. The main tasks and prerequisites for the application of the correlation-regression method. Correlation-regression analysis of natural resources of the Russian Federation
5. Applied data analysis	Statistical methods and data analysis for processing the results of environmental monitoring. Classifications in environmental geochemistry. Data analysis in environmental economics.

### 5.2\* Sections of disciplines and types of classes

№ п/п	Discipline section name	Lectures	Practical lessons	Independent work	Total hours
1.	1. Introduction	2	4	15	21
2.	2. State statistical observation	2	4	16	22
3.	3. Environmental statistics of enterprises and companies	2	4	16	22
4.	4. Methods of statistical processing and data analysis	2	4	16	22
5.	5. Applied data analysis	1	2	16	19

### 6. Laboratory workshop (if available) - NO

### 7. Practical lessons; seminars

Nr	Discipline section	Subjects of practical classes (seminars)	Total hours
1.	1. Introduction	Sources of statistical data in the field of environmental protection, ecological safety and environmental management	4
2.	2. State statistical observation	System of indicators for statistics of natural resources. Environment and natural resources statistics	4
3	3. Environmental statistics of enterprises and companies	Statistical observation in the field of environmental management and sustainable development at the level of enterprises and companies. Reporting formats	4
4	4. Methods of statistical processing and data analysis	Methods of statistical processing and data analysis. Practical calculations.	4
5	5. Applied data analysis	Statistical methods and data analysis for processing the results of environmental monitoring.	2

### **8. Material and technical base of the discipline:**

An auditorium equipped with multimedia equipment and a personal computer with a standard package of office programs.

### **9. Information support of the discipline**

*When studying the discipline, traditional information technologies are used to present the theoretical part of the material by the teacher (PowerPoint presentation).*

a) Software

MSWindows; MSOffice

b) databases, reference and search systems

[www.mnr.gov.ru](http://www.mnr.gov.ru) - site of the Ministry of Natural Resources of the Russian Federation;

<http://rpn.gov.ru/> - Federal Service for Supervision in the Sphere of Natural Resources (Rosprirodnadzor);

[www.ecoindustry.ru](http://www.ecoindustry.ru) - site of the journal "Production Ecology";

www.unep.org - site of the United Nations Environment Program;  
www.wwf.ru - site of the World Wildlife Fund.  
<http://burondt.ru/> - website of the BAT Bureau - information on the introduction of standardization based on the best available technologies  
[http://www.mnr.gov.ru/activity/directions/zelenye\\_standarty/zelenye\\_standarty/?sphere\\_id=124597](http://www.mnr.gov.ru/activity/directions/zelenye_standarty/zelenye_standarty/?sphere_id=124597) - information on the development, application and implementation of "green standards"  
[http://www.mnr.gov.ru/activity/directions/natsionalnyy\\_proekt\\_ekologiya/](http://www.mnr.gov.ru/activity/directions/natsionalnyy_proekt_ekologiya/) - information on the progress of the National Project "Ecology"

## 10. Literature

### Basic list

Frankenhuis W. E., Nettle D., Dall S. R. X. A case for environmental statistics of early-life effects //Philosophical Transactions of the Royal Society B. – 2019. – T. 374. – №. 1770. – C. 20180110. URL: <https://royalsocietypublishing.org/doi/pdf/10.1098/rstb.2018.0110>

Maronna R. A. et al. Robust statistics: theory and methods (with R). – John Wiley & Sons, 2019.:  
URL: [https://scholar.google.ru/scholar?output=instlink&q=info:I\\_2TiiangmoJ:scholar.google.com/&hl=ru&as\\_sdt=0,5&as\\_ylo=2019&scillfp=14115142568773574439&oi=lle](https://scholar.google.ru/scholar?output=instlink&q=info:I_2TiiangmoJ:scholar.google.com/&hl=ru&as_sdt=0,5&as_ylo=2019&scillfp=14115142568773574439&oi=lle)

### Additional list

Barnett V. Environmental statistics: methods and applications. – John Wiley & Sons, 2005.

Briggs D. J. Environmental statistics for environmental policy: genealogy and data quality //Journal of Environmental Management. – 1995. – T. 44. – №. 1. – C. 39-54.

Girshick A. R., Landy M. S., Simoncelli E. P. Cardinal rules: visual orientation perception reflects knowledge of environmental statistics //Nature neuroscience. – 2011. – T. 14. – №. 7. – C. 926-932. URL: <https://www.ncbi.nlm.nih.gov/pmc/articles/pmc3125404/>

Kottegoda N. T., Rosso R. Applied statistics for civil and environmental engineers. – Malden, MA : Blackwell, 2008. – C. 718. URL: [http://sutlib2.sut.ac.th/sut\\_contents/H122763.pdf](http://sutlib2.sut.ac.th/sut_contents/H122763.pdf)

Manly B. F. J. Statistics for environmental science and management. – Crc Press, 2008. URL: <http://ndl.ethernet.edu.et/bitstream/123456789/20448/1/129.pdf>

Ott W. R. Environmental statistics and data analysis. – CRC Press, 1994.

Reimann C. et al. Statistical data analysis explained: applied environmental statistics with R. – John Wiley & Sons, 2011.

Souiri M. et al. Application of Multivariate Statistics and Geostatistical Techniques to Identify the Distribution Modes of the Co, Ni, As and Au-Ag ore in the Bou Azzer-East Deposits (Central Anti-Atlas Morocco) //Economic and Environmental Geology. – 2020. – T. 53. – №. 4. – C. 363-381. URL: <https://www.koreascience.or.kr/article/JAKO202025465016723.pdf>

## **11. Methodical instructions for students on mastering the discipline (module)**

Independent work of students includes:

- individual study of theoretical material on the subject of the course (links to information sources are presented in the previous sections);
- study of additional material;
- preparation of abstracts on the topics specified in the program.

11.1. Independent study of additional theoretical material is carried out by students on an individual basis; the list of recommended information sources is given above.

11.2. Requirements for writing abstracts

Academic ethics, respect for copyright. In the first lesson, students are informed about the need to comply with the norms of academic ethics and copyright during their studies. In particular, information is provided:

- general information about copyright;
- citation rules;
- link formatting rules

All footnotes in the text are carefully checked and provided with “addresses”. It is not permissible to include in your work excerpts from the works of other authors without indicating this, to retell someone else's work close to the text without referring to it, to use other people's ideas without indicating the primary sources. This also applies to sources found on the Internet. You must specify the full site address. All cases of plagiarism must be excluded. If unjustified and incorrect borrowings are identified, the abstract is not accepted.

When preparing written works, the following must be submitted without fail: work plan; a list of used literature, drawn up in accordance with the current rules for the bibliographic description of used sources.

For the preparation of the abstract, only special relevant sources should be used. In addition to abstracts, the subject of which is related to the dynamics of any phenomena over many years, or the historical development of scientific views on any problem, sources should be used for a period of no more than 10 years.

The prepared essay should be presented at one of the classes in agreement with the teacher. Use of PowerPoint presentations (or those prepared using similar licensed or free software) is encouraged, but not required. The approximate time of the presentation is up to 15 minutes. The structure of the report and additional requirements for the quality of materials are determined by the chosen topic and are additionally discussed with the teacher.

**12. Fund of appraisal funds for intermediate certification of students in the discipline (module)** (developed in accordance with the requirements of the "Regulations for the formation of funds of appraisal funds", approved by order of the rector dated 05.05.2016 No. 420).

**Department of Applied Ecology**

APPROVED

at the meeting of the department

August 28, 2019, minutes No. 1

Head of the Department

\_\_\_\_\_ M.M. Redina

(подпись)

# **VALUATION FUND**

**ON THE EDUCATIONAL DISCIPLINE**

**ENVIRONMENTAL STATISTICS**

direction 05.04.05 "Ecology and nature management"

Program:

*Economics of natural resources management*

Qualification (degree) of the graduate –

*Master of Ecology and Nature Management*

## Passport of the fund of assessment tools by discipline

Направление 05.04.6 «Экология и природопользование»:

Дисциплина: Environmental statistics

Шифр Б1.О.01.04

**12.1. Балльно-рейтинговая система оценки и характеристика шкалы оценивания**

***Rating assessment system and characteristics of the assessment scale***

***Балльно-рейтинговая система оценки и характеристика шкалы оценивания***

Controlled discipline topic Контролируемая тема дисциплины	Forms of control ФОСы (формы контроля уровня освоения ООП)					Topic points Баллы темы
	Classroom work Аудиторная работа			Самостоятельная работа	Экзамен	
	Test / Тест	Test work Контрольная работа	Class work Работа на занятии	Доклад seminar report		
ОПК-6 ПК-3, ПК-4	1. Introduction	X		10		4
ОПК-6 ПК-3, ПК-4	2. State statistical observation	X		12		4
ОПК-6 ПК-3, ПК-3	3. Environmental statistics of enterprises and companies	X		12		6
ОПК-6 ПК-3, ПК-4	4. Methods of statistical processing and data analysis	X		10		8
ОПК-2 ОПК-6 ПК-3, ПК-4	5. Applied data analysis	X		12		10
	<b>Exam Экзамен</b>		15	56	15	14

**12.2** The maximum number of credits in the course is 3. At the same time, the following ratio is established between the number of points and the number of credits:

**Points to credits ratio**



Total points	Final assessment	Amount of credits
91	5	3
91-100	5	3
86 - 91	5 (B)	3
71-85	4 (C)	2
61-70	3+ (D)	1
51 - 60	3 (E)	1
21 - 51	2 (FX)	0
<21	2 (F)	0

6. Deciphering of grades is also accepted according to the specified document:
7. - A: "Excellent" - the theoretical content of the course has been fully mastered, without gaps, the necessary practical skills for working with the material learned have been formed, all the educational tasks provided for by the training program have been completed, the quality of their implementation was assessed by the number of points close to the maximum.
8. - B: "Very good" - the theoretical content of the course is mastered completely, without gaps, the necessary practical skills of working with the acquired material are basically formed, all the educational tasks provided for by the training program are completed, the quality of most of them is assessed by the number of points close to the maximum ...
9. - C: "Good" - the theoretical content of the course has been mastered completely, without gaps, some practical skills of working with the mastered material are not sufficiently formed, all the educational tasks provided for by the training program have been completed, the quality of performance of none of them has not been assessed with a minimum number of points, some types of tasks have been completed with mistakes.
10. - D: "Satisfactory" - the theoretical content of the course is partially mastered. but the gaps are not significant, the necessary practical skills to work with the acquired material are basically formed, most of the educational tasks provided for in the training program have been completed, some of the completed tasks may contain errors.
11. - E: "Mediocre" - the theoretical content of the course is partially mastered, some practical skills have not been formed, many of the educational tasks provided for by the training program have not been completed, or the quality of some of them is assessed by the number of points close to the minimum.
- FX: "Conditionally unsatisfactory" - the theoretical content of the course has been partially mastered, the necessary practical skills have not been formed, most of the educational tasks provided for by the training program have not been completed, or the quality of their implementation was assessed by the number of points close to the minimum; with additional independent work on the course material, it is possible to improve the quality of completing educational tasks.
- F: "Certainly unsatisfactory" - the theoretical content of the course has not been mastered, the necessary practical skills are not formed, all the completed study tasks contain gross errors, additional independent work on the course material will not lead to any significant improvement in the quality of the study tasks.

### ***12.3 List of competencies and stages of their formation***

General professional competence -2	Ability to apply modern computer technologies in collecting, storing, processing, analyzing and transmitting information and for solving research and production-technological problems of professional activity
General professional competence - 6	The ability to use in-depth knowledge of legal and ethical norms in assessing the consequences of their professional activities, the development and implementation of socially significant projects and to use in practice skills and abilities in the organization of research and scientific-production work, in the management of the scientific team
Professional competence -3	Possession of the basics of design, expert and analytical activities and research performance using modern approaches and methods, equipment and computing systems
Professional competence -4	Ability to use modern methods of processing and interpreting environmental information in scientific and industrial research

***12.4. Typical control tasks or other materials necessary to assess knowledge, skills, skills and (or) experience of activities, characterizing the stages of the formation of competencies in the process of mastering the educational program***

***Questions to prepare for exam***

1. The environment as an object of statistical observation.
2. Sources of statistical data in the field of environmental protection, ecological safety and environmental management
3. State statistical observation. Accounting and reporting systems.
4. Theoretical foundations of environmental statistics.
5. Characterization of natural resources as part of the national wealth.
6. System of indicators for statistics of natural resources.
7. Environment and natural resources statistics
8. Statistical observation in the field of environmental management and sustainable development at the level of enterprises and companies. Reporting formats.
9. Using observation results
10. Methods of statistical processing and data analysis.
11. Correlation and regression analysis.
12. Basic concepts of correlation and regression analysis.
13. The main tasks and prerequisites for the application of the correlation-regression method.
14. Multivariate approaches
15. Statistical methods and data analysis for processing the results of environmental monitoring.
16. Classifications in environmental geochemistry.
17. Data analysis in environmental economics.

**Sample topics of presentations**

1. State systems of statistical observation in the field of environment and sustainable development
2. Departmental and corporate systems of statistical observation in the field of environment and sustainable development

3. Green accounting and reporting
4. Environmental ratings of enterprises, cities, regions, countries of the world
5. Technologies for data analysis in the field of environment and sustainable development: practical applications
6. Software packages for environmental statistics

***12.4. Methodological materials defining the procedures for assessing knowledge, skills, and activity skills, characterizing the stages of the formation of competencies).***

The assessment of knowledge, skills and abilities is carried out using the components of the WCF presented in paragraphs. 12.1-12.34, in accordance with the sequence of acquisition of competencies indicated in table. p. 12.2.

Программа составлена в соответствии с требованиями ОС ВО РУДН/ФГОС ВО.

**Developers:**

Professor of the Department of Applied Ecology

**подпись**

**Khaustov A.P.**

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название кафедры

подпись

инициаль> фамилия